# Natural Attenuation Study

*A Partnership between US AFRL/MLQ, TVA, Academia, and Columbus, AFB, MS*

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## The Problem

Natural attenuation as a remedial alternative is a promising strategy limited only by our understanding of the phenomena surrounding the underlying processes. Most field studies of natural attenuation take place at previously contaminated sites where initial contamination took place years ago. Little or nothing is known about initial hydrologic, geochemical, or bacterial conditions at these sites. This study successfully addresses data gaps and provides valuable information to validate AFCEE, ASTM, US EPA, and state regulatory natural attenuation design protocols.

## The Results:

- ✓ **Identify** key indicators of natural attenuation of a hydrocarbon contaminant mass in a highly heterogeneous aquifer.
- ✓ **Demonstrate** that removing liquid product from a JP-4-fuel-contaminated site, coupled with passive remedial action, will lead to sufficiently low down-gradient contaminant chemical concentrations such that no further remedial action is necessary.
- ✓ **Provide** an extensive data set for validation of models and design protocols. Successful demonstration of this alternative will lead to huge cost savings if it is adopted at even a portion of the Air Force's fuel contamination sites.

## The Approach

In November 1995, a simulated jet fuel mixture of approximately 1100 kg was placed in the intensively characterized and instrumented heterogeneous aquifer at Columbus AFB, MS. The mixture was designed to act as a continuous source, similar to a leaking UST or a residual fuel spill. More than 300 sampling wells with multiple sampling points at each location allow sampling at a total of 6000 points. Water and splitspoon auger core samples are being used to follow plume development and natural attenuation.

**The use of an emplaced source at a clean site has two distinct advantages over the use of an existing plume.** Intensive background studies can be performed before source placement to characterize soil and groundwater properties and native microbial populations, so that initial conditions are known. Upon source emplacement, the plume can be monitored as it changes over time until it reaches steady state, and beyond. As the plume migrates from the source area, soil and groundwater properties characterized in background studies can be monitored to identify those most significant to the natural attenuation process.

## Payoff

**Is natural attenuation viable at your site?** The scientific foundation for selecting natural attenuation is enhanced through increased knowledge. Key indicators of natural attenuation are being identified and shed new light on the applicability of natural attenuation at specific contaminated sites. In addition, the role of anaerobic microbiological processes in the aquifer is being further reviewed to determine the contribution of this mechanism to removal of contaminants.

## Points of Contact

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